

REVISIONAL NOTES ON AUSTRALIAN CARABIDÆ.

PART V.

BY THOMAS G. SLOANE.

Tribe HELLUONINI.

Hope, *Coleopterist's Manual*, 1838, ii., 110; Lacordaire, *Genera des Coléoptères*, 1854, i., 90; Horn, G. H., *Trans. Amer. Ent. Soc.*, ix., 1881, 160.

Head punctate, one or two supraorbital sensitive hairs on each side. Antennæ stout, rising under distinct frontal plates (these plates punctate-setose). Mandibles with a single tooth near base, setose on outer side. Labrum large and prominent, with two, four, or six sensitive hairs. Labium with ligula large, corneous (in Australian genera setose on sides, and often on upper and lower sides); paraglossæ cartilaginous or corneous, small, narrow, pointed, not reaching to apex of ligula, very small and reduced in Australian genera. Maxillæ with inner lobe hooked (the hook behind the apex in some Australian genera); inner sides sometimes with a median protuberance. Palpi stout. Prothorax punctate. Elytra truncate (except in *Helluarchus*), striate; dorsal punctures present or not on third interstice; base not bordered near scutellum. Ventral segments not bordered on sides. Tarsi setose on upper surface, in ♂ biseriately squamose beneath (only the second and third joints with two narrow median rows of squamæ in all Australian genera); ungues simple.

All the genera known, to me, to belong to the tribe *Helluonini*, will be found tabulated below. The following genera are excluded here, mostly following former authors: *Helluodes*, *Planetes*, *Polystichus*, *Acrogenys*, *Lachnoderma*, *Litho-*

strotus (= *Lestianthus*), and *Parallelomorpha*. In regard to the last-mentioned genus, which is unknown to me in nature, an examination of the original figure and description has convinced me that it is not a member of the present tribe.

Primitive characters.—The following appear to be primitive characters in the Helluonini. *Body* and its members (including interstices and epipleura of elytra) densely punctate-setose; wings present. *Head* with two sensitive hairs on each side above eyes. *Antennæ* with three basal joints cylindrical and sparsely setose. *Mandibles* short. *Labrum* with six sensitive hairs. *Mentum* punctate, median tooth triangular. *Ligula* wide; two anterior sensitive setæ; margin not fringed with setæ. *Paraglossæ* narrow, cartilaginous, nearly as long as ligula, adnate to it, except just at tip (e.g., *Omphra*). *Abdomen* with sensitive apical hairs. *Legs*: anterior femora without a triangular prominence on lower side near base; tarsi, in ♂, with joints 1-4 dilatate and biserially squamose on lower side. According to the degree to which the characters mentioned above are represented in a species, so may it be regarded as approaching the ancient Helluonid type; and in accordance with the degree to which they become lost, so may it be supposed to depart from the original type.

Primitive characters of the Australian group.—Head with orbits protuberant and setose behind eyes. *Antennæ* with fourth joint less cylindrical than third and densely pubescent (e.g., *Helluodema*). *Labrum* with more than two sensitive hairs. *Mentum* with a prominent triangular median tooth. *Ligula* with a fringe of setæ. *Paraglossæ* cartilaginous, rudimentary. *Palpi* with penultimate joint short. *Pronotum* densely punctate and longitudinally rugose. *Abdomen* with apical sensitive hairs (e.g. *Dicranoglossus**). *Legs*: anterior femora with an antebasal prominence on lower side; anterior tarsi in ♂, with second and third joints dilatate and biserially squamulose in middle of lower side.

* Probably a case of reversion.

Following the views given above, the tribe may be divided into two divisions or groups, as under.

- i. Anterior femora without antebasal protuberance. Ligula not fringed with setæ. Head always with two supraorbital hairs on each side.....*Extra-Australian group.*
- ii. Anterior femora with a triangular prominence on lower side near base. Ligula setose on sides. Head with one supra-orbital sensitive hair on each side (except *Epimicodema*)...
.....*Australian group.*

i. *Extra-Australian group.*—*Table of Genera.*

- 1(4).Mentum with a long spiniform median tooth.
- 2(3).Tarsi with fourth joint entire..... *Macrocheilus.*
- 3(2).Tarsi with fourth joint bilobed..... *Creagris.*
- 4(1).Mentum with a strongly developed stout tooth.
- 5(8).Tooth of mentum long and pointed.
- 6(7).Elytra with odd dorsal interstices costate, even dorsal interstices depressed, pluripunctate; prothorax with basal angles distant from peduncle..... *Triænogenus.*
- 7(6).Elytra with dorsal interstices equal; prothorax with basal angles near peduncle..... *Meladroma.*
- 8(5).Tooth of mentum triangular.
- 9(10).Apterous Asiatic genus..... *Omphra.*
- 10(9).Winged American genera.
- 11(12).Labrum not triangularly prominent in middle..... *Helluomorpha.*
- 12(11).Labrum triangularly prominent in middle..... *Pleuracanthus.*

Genus CREAGRIS.

Nietner, Journ. Asiat. Soc. Beng., 1857: *Pseudhelluo* Castelnau, Trans. Roy. Soc. Victoria, viii., 1868, 104.

There seem to be two species of the genus *Creagris* in Queensland, *C. labrosus* Niet., and *C. wilsoni* Cast. Following Gestro, these can be separated as under:—

- Prothorax with basal angles obtuse..... *C. labrosus* Niet.
- Prothorax with basal angles acute..... *C. wilsoni* Cast.

CREAGRIS LABROSUS Nietner.

Journ. Asiat. Soc. Beng., 1857, 139; Gestro, Ann. Mus. Civ. Genova, vii., 1875, 871.

A single specimen, given to me by Mr. C. French as from Mackay, is in my collection. I cannot differentiate it from a specimen from Java, which is evidently *C. labrosus*. Length 9 mm.

Hab.—Queensland, Java, Ceylon.

C. wilsoni Cast., from Brisbane, is unknown to me. Gestro described it, and gives a figure of the prothorax, showing the sharply marked basal angles of the prothorax; he gives the length as "10½ mm." (*l.c.*, pp.869, 872).

ii. *Australian group.*—*Table of Genera.*

- 1(10). Head with large postocular prominences.
- 2(5). Labrum convex, apex pointed and with more than four sensitive hairs; clypeus emarginate.
- 3(4). Mentum with strong triangular median tooth; ligula rounded at apex..... *Helluonidius.*
- 4(3). Mentum edentate. Ligula furcate. (Colour cyanaceous)..... *Dicranoglossus.*
- 5(2). Labrum depressed, apex widely rounded, never with more than four sensitive hairs; clypeus truncate. (Mentum with triangular median tooth. Colour black).
- 6(9). Labrum with four sensitive hairs.
- 7(8). Prothorax strongly sinuately constricted to base; ligula narrow, elongate, rounded at apex; maxillæ not extending forward beyond apical hook..... *Helluosoma.*
- 8(7). Prothorax lightly narrowed to base; ligula wide, short, emarginate at apex; maxillæ with apex projecting beyond hook..... *Helluodema.*
- 9(6). Labrum bisetose. (Ligula wide, emarginate at apex) *Epimicodema.*
- 10(1). Head with postocular prominences small or obsolete.
- 11(16). Apterous; metasternum shorter between middle and posterior coxal cavities than length of posterior coxæ, episterna short, wide posteriorly; elytra with ninth interstice not disproportionately narrow in comparison with eighth.
- 12(13). Mentum with lobes elongated to a point at apex, median tooth triangular; maxillæ with inner side not protuberant in middle; elytra with third, fifth, and seventh interstices costate, or carinate. *Helluo.*
- 13(12). Mentum with lobes ordinary, median tooth short, wide; maxillæ with a strong triangular median prominence on inner side; elytra with interstices not costate.
- 14(15). Elytra rounded at apex, depressed on disc, strongly declivous to sides and apex..... *Helluarachus.*
- 15(14). Elytra truncate, gently convex..... *Helluapterus.*

- 16(11). Winged; metasternum much longer between middle and posterior coxal cavities than length of posterior coxæ, episterna elongate; elytra with ninth interstice very narrow in comparison with eighth.
- 17(23). Ligula wide, rounded at apex; elytra with eighth interstice pluripunctate.
- 19(20). Mentum with a short wide median tooth; maxillæ with a strong triangular prominence on inner side (except in *G. longipenne*)..... *Gigadema*.
- 20(19). Mentum edentate; maxillæ with inner side not triangularly protuberant in middle.
- 21(22). Prothorax hexagonal, strongly narrowed to base, anterior angles marked in ♂, rounded in ♀, basal angles close to peduncle; ♂ with humeral angles of elytra rounded..... *Neohelluo*.
- 22(21). Prothorax transverse, lightly narrowed to base, anterior angles rounded, basal angles distant from peduncle; ♂ with humeral angles of elytra dentate. *Ænigma*.
- 23(17). Ligula furcate; elytra with eighth interstice biserially punctate..... *Ametroglossus*.

Phylogeny.—In studying the phylogeny of the Helluonini, attention should be given to the “primitive characters” previously mentioned, and to those which follow; a careful consideration of all of them is necessary in seeking for evidence, on which to base conclusions as to the position of genera in the tribe, or of species in the genera. This part of the subject is treated here only in reference to the Australian Helluonini; and to enable the bearing of some obscure and perplexing phases in the study of phylogeny to be better comprehended, the following note on convergence is offered.

Convergence.—The term convergence has been used by Darwin to denote those resemblances which are so often found between living things, but which are not due to inheritance from a common ancestral type. Few facts in natural history fill the mind with more astonishment than many of the cases of convergence between animals not at all nearly allied. For instance, the resemblance in external form between whales and fish (Origin of Species, sixth ed., Chapter iv., p.100).

In the Insecta, there are innumerable instances of convergence between distant members of the class. Wallace gives many such

in his book "Darwinism" (Chapter ix., p.258). I have seen at Mulwala, N. S. W., a moth that resembled a common ichneumon wasp; and, at Brisbane, running on the trunks of trees, a *Mantispa* that looked like a tiger-beetle. There are instances of convergence between insects of different Orders, which are attributed by naturalists to "mimicry," and (as in cases of resemblance due to protective colouring among animals, birds, and insects) we can here see a cause for convergence.

Coming to the Order Coleoptera, there are many cases of convergence, as when longicorn beetles resemble weevils and Malacoderms (perhaps mimicry). Often when the general resemblance is not great, there is similarity in different parts of the body. For example, the large, convex labrum covering the mandibles in *Dystipsidera* (Cicindelidæ) and *Helluonidius* (Carabidæ); the elytra, with lateral parts inflexed (*pseudoepipleuræ*), in *Mantichora* and *Amblychila* (Cicindelidæ), and *Storthodontus*, *Dyscherus*, and *Crepidopterus* (Carabidæ); the posterior trochanters pointed at apex in *Amblychila* and *Parroa* (Carabidæ).

Taking the Carabidæ, the following instances of convergence may be noted; doubtless many others would be found by careful study.

Clypeus and mandibles armed—some species of the genera *Carenidium* and *Carterus*. Maxillæ with outer lobe in one piece—*Amerizus*, *Callistus*, *Stenochila* and *Homothes*. Submentum armed—*Diectes* and some species of *Gigadema*. Elytra multistriate in the genera *Pamborus*, *Loricera*, *Tachys* (*T. nervosus* Sl.), *Planetes* (*P. australis* Macl.), *Catascopus* (*C. mirabilis* Bates). Ventral segments with a transverse sulcus—*Clivina*, *Dicelus*, *Baripus*, *Cratogaster*, etc. Anterior femora more or less dentate on lower side in ♂—*Blethisa*, *Mystropomus*, some species of *Chlanius*, *Rhæbolestes*, etc. Penultimate joint of tarsi bilobed—*Amblytelus*, *Colpodes*, *Helluonidius*, *Sarthrocrepis*, etc.

These are all cases in which the resemblances seem more likely to be due to convergence than to reversion; but, as the

natural groups in which resemblances are found become smaller, inheritance may be given more weight, so that, speaking generally, we need seldom go beyond reversion to explain such resemblances; but, it is not always the case that heredity, or atavism, is the true key to the riddle of similarity, even in species that are not remote from one another.

The difficulty of distinguishing between convergence and reversion is often very great, and the interpretation of such cases depends largely on the mental attitude of the inquirer. The nearer the relationships between the species involved, the greater becomes the perplexity as to whether doubtful instances of likeness in structure should be assigned to convergence, or to reversion. There is a third category in which should be placed cases of reversion with convergence, as, when two or more descendants, from the same stem, independently converge towards such ancestral stem along the same lines of reversion. It may be said this is merely reversion; but, when two descendants from one ancient type, after differentiation and modification of more than one character, revert towards their common ancestral form, each by a different character, there is reversion but no convergence; so when there is both reversion and convergence, a distinctive term, such as *reversionary convergence*, becomes useful.

The resemblance between the form of the lobes of the mentum and the inner lobe of the maxillæ in the genus *Helluo*, and in *Gigadema longipenne*, I believe to be due to reversionary convergence. As I interpret the perplexing case of the resemblances between the mentum and the inner lobe of the maxillæ in *Helluo* and *G. longipenne*, these resemblances are due more to convergence than to reversion. The following evidence may be offered in support of this view. The long, pointed lobes of the mentum and the ordinarily shaped maxillæ of *G. longipenne* are exceptional in the genus *Gigadema*, but are the ordinary form in *Helluo* (two species, not nearly allied). Therefore we may feel justified in believing the prototype of *Helluo* had these characters, which are also found in

Ænigma. The matter becomes far more intricate when we come to *G. longipenne*. All the other species of *Gigadema* have the mentum without the long points to the lobes that are found in *G. longipenne*, and have the inner lobe of the maxillæ with a strong triangular median prominence in the middle of the inner side. Only in *G. longipenne* do these parts resemble the form found in *Helluo*; but *G. longipenne* is certainly a *Gigadema*, and not a *Helluo*, nor, as far as I can see, is it a representative of the primitive type of *Gigadema*. I believe the ancient type of *Gigadema* is represented rather by *G. sulcatum*. In my conception of the phylogeny of the species of *Gigadema*, *G. longipenne* is far removed from *G. sulcatum*, and more allied to *G. nocte*. It probably branched at a remote period from the stem of which *G. nocte* is a present-day representative. [The corneous, rudimentary paraglossæ of *G. longipenne*, resembling those of *G. bostocki* of the *G. nocte*-group (together with other characters), have helped to influence me in coming to this conclusion.] If this view be correct, the maxillæ of *G. longipenne* have converged towards those of *Helluo* by an independent reversionary line in the direction of the ancient type from which both *Gigadema* and *Helluo* are derived, and leading away from its congeners. In this case, an inherited tendency towards ordinary maxillæ may have helped, as an influence of reversion; but, it is also a case of convergence, or, it may be said, of reversionary convergence. With the simplification of the maxillary lobe, the long, pointed lobes may have arisen by correlation, but, still, also as a case of reversionary convergence.

The long, curved, sharp, horn-like points of the lobes of the mentum in *G. longipenne*, which are formed by the epilobes, may be an example of the cause which often seems to result in many different parts of the body throughout the animal kingdom, such as ornaments, weapons, or even structures which do not seem of vital importance, becoming so exaggerated in their development, that their presence would appear to be a detriment, rather than a benefit, to their possessors. Such cases of

what appears to be over-development of characters have always been advanced as an objection to the theory of natural selection; because, no character could have been carried by natural selection beyond the limit of usefulness or benefit to the species. It has appeared to me, in such cases of hypertrophy of a character, the reason may have been that it had become, as it were, an essential endowment of the species, and may have kept on gaining in size, when not injurious to the species, by the accumulated force of such endowment. Such a force of endowment could, of course, only operate within bounds limited by natural selection; as soon as the point of injury to the species was reached it would be checked by natural selection.

Bringing the scope of our inquiry into resemblances due to convergence within the narrow limits of the *Helluonini* of the Australian group, we find the following cases which seem to be instances of convergence rather than of reversion. Whether any of them are due to reversionary convergence; or, whether all of them are merely instances of convergence, unassisted by hereditary influences, are subjects which it is probably not profitable to worry about. In any case, such reversionary influences as may have given them any primary impulse of origination, or direction, are very obscure, and have not been perceived by me.

(1). A pointed labrum in *Pleuracanthus* and *Helluonidius* (also in *Dicranoglossus*). This is more likely to be due to the adoption of the same habits of catching similar prey, having led to analogous development rather than to reversion.

(2). A furcate ligula in *Dicranoglossus* and *Ametroglossus*. I see no evidence of any near relationship between these genera, and regard the presence of a forked ligula in each (which is found nowhere else in the tribe) as a case of convergence, though these forms may have been derived from a common, remote, ancestral stem in which the ligula was excised.

(3). The presence of long, pointed lobes to the mentum, and an ordinarily shaped, inner lobe to the maxillæ in *Helluo* and

G. longipenne, seem to me (as argued above) not decided evidence of close relationship. This is likely a case of reversionary convergence.

(4). An edentate mentum in *Dicranoglossus* and *Ænigma*. *Dicranoglossus* is far more closely related to *Helluonidius*, than it is to *Ænigma* and *Neohelluo*, the only other genera without a median tooth to the mentum. However, convergence by loss of a character is of far less taxonomic importance, and less difficult to explain (such reduction of characters occurs in every direction among insects), than the great development of, or acquisition of a character.

(5). Elytral sculpture in *Helluo costatus* and the African *Trienogenius*.—The resemblance in this case may be due to reversion; it is a question on which I have not formed an opinion. But the relationship between *Helluo* and *Trienogenius* must be exceedingly remote.

(6). Colour.—The green colour of *Helluonidius* and *Ænigma* has probably been acquired independently. Chaudoir also reports *Pleuracanthus cribricollis* as having the elytra of a bluish tint.

Chætotaxy.—In the Australian group of the Helluonini, the following hairs are of importance. *Head*, with one sensitive hair above each eye in all our genera, except *Epimicodema*; in all genera of the extra-Australian group there are two hairs. *Labrum*: in all the genera of the extra-Australian group there are six sensitive hairs on the labrum, but, in the Australian group, only *Dicranoglossus* has more than four sensitive hairs (ten); in *Helluonidius*, *Helluosoma*, and *Helluodema* there are four hairs; in the rest of our genera only two fully developed, one near each anterior angle, rising from a conspicuous puncture. *Clypeus*: *Helluonidius* and *Dicranoglossus* have two, long, sensitive hairs on each side of the clypeus, all other genera one hair on each side. *Ligula* always fringed with setæ in the Australian group, and with the usual two, anterior, sensitive setæ (in *Helluosoma*, *Ametroglossus*, and *Dicranoglossus* the sensitive setæ are unusually distant

from the apex); generally, there are some other setæ on the lower side of the ligula, besides the two, anterior, sensitive ones, but, these may be wanting (e.g., *Helluonidius*, *Dicranoglossus*, and *Ametroglossus*); sometimes the lower side of the ligula is pluripunctate (*Gigadema bostocki*, etc.); the inner surface of the ligula is not usually setose, except near the margins; but in *Ænigma*, there are a few long setæ on the basal part of the inner side, and in *Neohelluo* the basal half is plurisetose. *Labial palpi*: the penultimate joint has always two well developed setæ on the inner side, and, also, some smaller setules, which were ignored by Dr. G. H. Horn, when he described the penultimate joint of the labial palps in the tribe *Helluonini* as with two setæ. In *Gigadema nocte* and allied species, the elongate joint is plurisetose, with no great difference in development among the setæ; in *Helluonidius*, there are four, long setæ. *Prothorax*, normally with two lateral, marginal, sensitive hairs; the anterior hair is always present at the widest part, but, in our genera, the posterior hair is generally so reduced in size, and so confused with other setæ, that it cannot be distinguished. *Abdomen*: the apical ventral segment is always furnished with long "anal hairs" in the extra-Australian genera; but these are only found in *Dicranoglossus* among the genera of the Australian group. *Mandibles*: the outer side of the mandibles is setose in the *Helluonini*; often the setæ are hardly perceptible, and placed on the upper edge of the scrobe, as in *Ænigma*. *Nuridius* (Pterostichini) and *Diocetes* (Harpalini) are the only other Carabs in which I have observed setæ on the outside of the mandibles.

Note.—Dr. Walther Horn has indicated that, in the Cicindelidæ, the primitive colour of the setæ is dark; the same thing applies to the Carabidæ. In the *Helluonini*, I have observed a tendency for pale setæ to appear only in *Helluonidius*, *Dicranoglossus*, and *Ænigma*.

Colour: probably a more or less brownish tint was the primitive colour of the *Helluonini* (e.g. *Helluomorpha*

texana); but, in most of the present-day species, this has deepened into piceous, or black. *Macrocheilus* has yellowish spots on the elytra, *Helluonidius cyanipenne* has the elytra bright greenish-blue, *Dicranoglossus resplendens*, and *Ænigma iris* have the whole upper surface cyaneous. One concludes that species of a polished, black colour are derived from duller coloured ancestors, and that those with bright colours are still more advanced in the matter of colour.*

Important Characters.—*Antennæ*: the longer and more slender the antennæ are, the more they depart from the ancestral type; as the fourth joint becomes more cylindrical and less pubescent, so does it become more specialised. *Palpi*: the penultimate joint of both the labial and maxillary palps varies greatly in length, being shortest in *Helluodema unicolor*, and longest in *Gigadema bostocki* and allied species. *Ligula*: the form is very variable in different genera, as given in the generic diagnoses which follow. [It may be noted that I follow Dr. G. H. Horn in applying the term labium to the whole organ (*i.e.*, ligula and paraglossæ), and in restricting the term ligula to the central piece alone.] *Paraglossæ*: the form of the labium in the Helluonini, in respect to its paraglossæ, has been the subject of controversy. Bonelli, when diagnosing the genus *Helluo*, described the labium as *without paraglossæ*; this view was adopted by Lacordaire in his "Genera des Coléoptères," though he was aware that Schmidt-Goebel, in 1847 (Coleop. Birman.), had described the paraglossæ of *Macrocheilus* as *united with the ligula, and appearing as if wholly wanting*; Dr. G. H. Horn adopted Schmidt-Goebel's opinion in his "Genera of Carabidæ" (1881), and declared the usual idea that the labium was without paraglossæ to be "quite erroneous." The view of Schmidt-Goebel is strictly correct, but Bonelli's idea is not "quite erroneous."

* In this connection, I note from my collection: one specimen of *Gigadema bostocki* var. *intermedia*, from Jerilderie, N. S. W., shows a distinct, dull reddish spot near the apex of one elytron; and two specimens of *G. nocte*, from Cooktown, two similar spots, one on each elytron.

In Australian genera (all have been dissected by me except *Helluapterus* and *Helluarchus*), it is only possible to observe the paraglossæ with accuracy from the inner side of the labium; in all our genera they are very rudimentary, in some being reduced merely to the lateral parts of the cartilaginous basal support of the ligula (e.g. *Helluosoma* and *Helluo*). In *Omphra* (the only foreign genus examined by me), the narrow, cartilaginous paraglossæ may be seen attached to the sides of the wide ligula, their point being free and not extending to the apical angle of the ligula.

Maxillæ: the cardo is triangularly prominent at the external angle in *Gigadema maxillare* ♂; a slight tendency to this form is noticeable in *Neohelluo angulicollis*; inner lobe of variable form. It is of ordinary form in most genera (e.g. *Helluo*), but the following are variations, (a) apex carried forward beyond the apical hook (the hook set almost at right angles to the galea, e.g., *Helluodema* and *Neohelluo*); (b) apex with a tuft of hair (e.g., *Ametroglossus* and *Neohelluo*); (c) galea triangularly protuberant in middle [*Gigadema* (except *G. longipenne*), *Helluapterus*, and *Helluarchus*]; the outer lobe is of variable shape, in *Dicranoglossus* long, slender, and glabrous, in *Gigadema* stout, and setose. *Prothorax*: the form varies; in *Neohelluo*, the anterior angles are marked; in *Gigadema grande*, the anterior margin is prominent in the middle (especially in ♂); the distance of the basal angles from the peduncle varies, in *Gigadema* near the peduncle, in *Enigma* distant from it; the base is truncate in *Helluapterus* and *Helluarchus* (angles not near peduncle), but slopes forward to the basal angles on each side of the peduncle in *Helluo*. The anterior and basal margins are fringed with hair; sometimes the fringing hairs are wanting on the lower part of the base, sometimes present (e.g., *Gigadema*, *Helluo*). *Elytra*: the stem, from which the Helluonini are derived, evidently had the interstices of the elytra closely setigero-punctate; but a tendency for these punctures to be reduced to two rows, on some of the interstices, must have appeared as a very early

character in the tribe. The biseriate disposition of the punctures seems to have originated on the odd interstices, spreading backwards from the base (in *Neohelluo* with triseriate interstices, the punctures become biseriate just before the apex on the second, third, and fourth interstices). The eighth interstice has remained pluripunctate in more cases than any other interstice, and here a tendency to loss of punctures is a recent character, but no proof of affinity (e.g., it occurs in South American species of *Helluomorpha*, and in the Australian *Ametroglossus niger*; a large species ticketed *Helluomorpha gygates* Chaud., in the Ehlers collection, has the second, fourth, and sixth interstices impunctate, the fifth and seventh uniseriately punctate near stria on outer side). The unusually narrow, ninth interstice, in comparison with the wide eighth, is characteristic of the small Australian section including *Gigadema*, *Neohelluo*, *Ænigma*, and *Ametroglossus*. *Prosternum*: this varies in convexity (depressed in *Epimicodema* and *Ametroglossus*, convex in *Ænigma*). Sometimes there is a transverse sulcus along the anterior margin (e.g., *Gigadema*), but sometimes this is wanting (e.g., *Ametroglossus*). The intercoxal declivity varies; it is strongly declivous in *Helluo* and *Helluapterus*, more gently so in *Gigadema nocte* and *Helluarchus*; sometimes it ends in a flattened flange against the peduncle, sometimes the flange is wanting (e.g., *Helluarchus*). *Legs*: there are varying forms of the anterior tibiæ; (a) stout, wide at apex, inner notch deep, upper spine at about one-half the length of the tibia, often nearer base than apex (type, *Helluo*); (b) long, narrow, with inner notch shallow and much nearer apex (type, *Gigadema*). In *Helluarchus*, *Helluapterus*, *Ænigma*, and *Ametroglossus*, the anterior tibiæ incline towards the form found in *Gigadema*, which is more recent than the form found in *Helluo*.

Characters peculiar to the Australian group.

Head with one sensitive hair on each side. *Antennæ* with fourth joint long, sparsely setose (e.g., *Gigadema*). *Clypeus* emarginate (*Helluonidius* and *Dicranoglossus*). *Labrum* bisetose;

form convex, pointed (*Helluonidius* and *Dicranoglossus*). *Mentum* with epilobes developed into strong mucrones (e.g., *Gigadema longipenne*). *Ligula* setose on sides, form deeply furcate. *Maxillæ* with galea prominent at apex. *Legs*: anterior femora with an antebasal prominence; tibiæ long, with notch towards distal end. *Secondary sexual characters of ♂*: mandibles often very long; submentum armed (e.g., *G. grande* MacI.); maxillæ with cardo strongly triangularly prominent at external angle (*G. maxillare* Sl.); prothorax protuberant (*G. grande*); elytra with humeral angles dentate (*Ænigma*).

Genus HELLUONIDIUS.

Chaudoir, Rev. & Mag. Zool., 1872, 216; *Helluosoma* Castelnau, (partim), Trans. Roy. Soc. Victoria, viii., 1868, 107.

Winged. Setosity white. Head convex, sharply narrowed to neck; eyes large, convex, enclosed at base in large setose orbits; one supraorbital sensitive hair on each side. Clypeus emarginate, glabrous in middle, two sensitive hairs on each side. Labrum long, convex; middle of anterior margin triangularly prominent; a fine hair-like seta on each side of median prominence, a larger seta at each anterior angle of labrum. *Mentum* with lobes short, wide; epilobes forming the short, stout, pointed apex; median tooth wide, triangular, prominent. *Ligula* rather narrow, convex, rotundate at apex. Palpi elongate; labial with apical joint lightly securiform, shorter than penultimate. Maxillæ with inner lobe a little inflated on inner side opposite origin of outer lobe. Prothorax punctate, ampliate and rounded on sides anteriorly, strongly sinuate-angustate to base; disc with three indistinct longitudinal ridges. Elytra striate; interstices not raised or nitid in middle, closely punctate, third with a row of widely spaced dorsal punctures. Tarsi setose; penultimate joint bilobed. Type, *Ænigma cyanipenne* Hope.

The genera *Helluonidius* and *Dicranoglossus* form a little terminal group, derived from the primitive Australian Helluonini along a different line of descent from any other of the present-day genera. These two genera have been placed first in the Table of genera given in this paper, because of their extreme

isolation, to prevent a break in the arrangement of the other genera. Some remote general affinities towards *Helluosoma* may be detected, but none to any of the genera with the labrum bisetose. The species of *Helluonidius* are found under bark on tree-trunks. There are four species in Australia, and one (*H. chrysocomes* Maindron) has been reported from New Guinea.

The Australian species may be divided into two groups by their colour.

Species wholly black ... ..	...	...	...	...	{	<i>H. aterrimus</i> Macl.
					{	<i>H. latipennis</i> Macl.
Species with elytra cyaneous ... ..	...	...	...	...	{	<i>H. cyaneus</i> Cast.
					{	<i>H. cyanipennis</i> Hope.

HELLUONIDIUS ATERRIMUS Macleay.

Helluosoma aterrimum Macleay, Trans. Ent. Soc. N. S. Wales, ii., 1873, 323.

I have seen the type of *Helluosoma aterrimum* Macl., in the Macleay Collection, and have noted that it has the labrum and clypeus of *Helluonidius*, to which genus it belongs. Length 8 lines, after Macleay. I have the following note, made at the Macleay Museum, with both *H. aterrimus* and *H. latipennis* Macl., before me. "Differs from *H. latipennis* by size smaller, prothorax less coarsely and closely punctate; elytra narrower, interstices flat (not the least convex), less coarsely punctate. It is another species."

HELLUONIDIUS LATIPENNIS Macleay.

Helluosoma latipenne Macleay, Proc. Linn. Soc. N. S. Wales (2), ii., 1887, 217.

Black. Head 3.65 mm. across eyes, strongly constricted behind eyes; orbits large and setigerous behind eyes; clypeus emarginate; labrum long, convex, pointed at apex. Prothorax small, transverse (2.8 × 4 mm.), truncate at base and apex, wider at apex (3.3 mm.) than at base (2.5 mm.). Elytra much wider than prothorax (10.5 × 6.5 mm.), punctate-striate; interstices 3-seriately punctate, even interstices a little wider and more closely punctate than the odd ones. Length 19.21 mm.

Hab.—Tropical Queensland: Kuranda and Mareeba (Dodd), Atherton (Sloane).

HELLUONIDIUS CYANEUS Castelnau.

Helluosoma cyanca Cast., Trans. Roy. Soc. Victoria, viii., 1868, 109; *Helluonidius cyaneus* Gestro, Ann. Mus. Civ. Genova, vii., 1875, 875.

Black, elytra dark cyaneous. Differs from *H. cyanipennis* Hope, by elytra duller-coloured; puncturation of elytra stronger, etc. Length 17.5-19 mm.

Hab.—Coastal districts north from Sydney: Sydney (Carter), Clarence River and Rockhampton (*vide* Castelnau), Coff's Harbour.

HELLUONIDIUS CYANIPENNIS Hope.

Enigma cyanipenne Hope, Proc. Ent. Soc., 1842, 46; Ann. Nat. Hist., ix., 1842, 462; Castelnau, Trans. Roy. Soc. Victoria, viii., 1868, 109; *Helluonidius cyanipennis* Chaudoir, Rev. & Mag. Zool., 1872, 216; Gestro, Ann. Mus. Civ. Genova, vii., 1875, 875; *Enigma viridipenne* Macleay, Proc. Linn. Soc. N. S. Wales, (2), ii., 214.

H. cyanipennis is distinguished by its bright blue elytra. Length 18 mm. I have seen the type of *Helluosoma viridipenne* Macleay, in the Macleay Museum, and consider it identical with Hope's species.

Hab.—Tropical Australia, from Townsville to King's Sound.

Genus DICRANOGLOSSUS.

Chaudoir, Rev. & Mag. Zool., 1872, 217.

Winged. Setosity pale. Form rather narrow. Head wide; vertex setigero-punctate; neck wide; eyes prominent; orbits rather small behind eyes, pilose; several elongate hairs near eyes on each side. Antennæ not long, thick; four basal joints cylindrical. Clypeus emarginate, with angles prominent, setose, with two longer prominent hairs on each side. Labrum convex; anterior margin triangularly prominent, 10-setose. Mentum without median tooth. Ligula deeply excised, bilobed; lobes obtuse and ciliate at apex. Palpi: labial with apical joint stout, truncate; maxillary with penultimate joint small, apical joint lightly securiform. Maxillæ with inner lobe sharply hooked; apex projecting a little beyond hook, and ciliate. Prothorax setigero-punctate, strongly and roundly ampliate at anterior fourth, strongly sinuate-

angustate to base; disc with three subobsolete longitudinal ridges. Elytra with interstices 1-7 lightly convex, biserially punctate. Tarsi setose; penultimate joint small, simple. Type, *Helluosoma resplendens* Cast.

The genus *Dicranoglossus* is a terminal one, allied only to *Helluonidius*, and derived from the same stem. Found under bark on tree-trunks.

DICRANOGLOSSUS RESPLENDENS Castelnau.

Helluosoma resplendens Castelnau, Trans. Roy. Soc. Victoria, viii., 1868, 109: *Dicranoglossus resplendens* Chaudoir, Rev. & Mag. Zool., vii., 1872, 217; Gestro, Ann. Mus. Civ. Genova, vii., 1875, 874: *Ænigma parvulum* Macleay, Trans. Ent. Soc. N. S. Wales, ii., 1873, 323.

Upper surface bright blue. Prothorax small (1.9 × 2.8 mm.); basal angles near peduncle; elytra oblong (7 × 4 mm.); eighth interstice not divided from ninth, coarsely punctate. Last ventral segment with several long setæ on apical margin. Length 12.5 mm.

I have identified *Ænigma parvulum* Macl., as identical with *H. resplendens* from Macleay's types.

Hab.—Tropical Australia, from Rockhampton to King's Sound.

Genus HELLUOSOMA.

Castelnau, Trans. Roy. Soc. Victoria, viii., 1868, 107.

Elongate, depressed, winged, black. Head sharply narrowed to neck; one supraorbital sensitive seta on each side; eyes convex, enclosed behind in large orbits. Antennæ rather long, compressed; three basal joints cylindrical, fourth short, subcylindrical. Labrum large, convex in middle of apex, four-setose. Mentum with a short triangular median tooth; lobes short, pointed (point formed by the epilobes). Ligula convex, narrow, elongate, roundly obtuse at tip; two sensitive hairs distant from apex. Palpi stout. Maxillæ with inner lobe narrow, without a median prominence on inner side; apical hook lightly inturned, its outer edge curving evenly with outer

side of galea. Prothorax a little broader than long; sides ampliate and rounded at anterior two-thirds, strongly sinuate-angustate to base; basal angles near peduncle; border reaching base; disc with three, indistinct, longitudinal ridges. Elytra one-half wider than prothorax; interstices biserially punctate towards base, eighth densely punctate. Anterior tarsi wide; penultimate joint short, wide, deeply emarginate. Type, *H. atrum* Castelnau.

Habits unknown to me, but, I believe, terrestrial.

An isolated terminal genus of ancient origin, containing two species, *H. atrum* Cast., and *H. longicolle* Macl.

HELLUOSOMA ATRUM Castelnau.

Trans. Roy. Soc. Victoria, viii., 1868, 107; Chaudoir, Rev. & Mag. Zool., 1872, 216.

H. atrum can be identified from the generic diagnosis given above. Dimensions: length 15.5; proth., 2.75 × 3; el., 8 × 4.5 mm.

Hab.—Tropical Australia, from Rockhampton to Pine Creek.

H. LONGICOLLE Macl., Proc. Linn. Soc. N.S.Wales,(2), ii., 1887, 217.

I have seen the types of *H. longicolle* in the Macleay Museum, and have noted it as a species distinct from *H. atrum* Cast., but without recording the differences; and I cannot now indicate them.

Genus HELLUODEMA.

Castelnau, Trans. Roy. Soc. Victoria, viii., 1868, 105: *Simoglossus* Chaudoir, Rev. & Mag. Zool., 1872, 217.

Parallel, depressed, winged, black. Head punctate, constricted to a neck behind; one supraorbital sensitive hair on each side; eyes strongly enclosed behind in large orbits. Antennæ short, compressed; joints 1-3 cylindrical. Labrum large; anterior margin arcuate, slightly prominent in middle, 4-setose. Mentum with a prominent, triangular, median tooth; lobes triangular, pointed. Ligula wide, emarginate in middle of apex. Palpi short, stout. Maxillæ with inner lobe lightly

and roundly inflated on inner side opposite origin of outer lobe, sharply hooked; apex extending forward greatly beyond hook. Prothorax very little wider than head, punctate, lightly narrowed to base; sides lightly rounded, not ampliate; lateral border terminating a little before base. Elytra narrow, parallel, interstices costate with summits nitid, biseriately punctate. Legs short; tarsi short, penultimate joint of anterior tarsi short, wide, emarginate. Type, *Ænigma unicolor* Hope.

Habits terrestrial.

It is a terminal genus, not closely allied to any other.

HELLUODEMA UNICOLOR Hope.

Ænigma unicolor Hope, Proc. Ent. Soc., 1842, 47; Ann. Nat. Hist., ix., 1842, 426: *Helluomorpha batesi* Thomson, Arch. Ent., 1857, 134: *Helluodema batesi* Castelnau, Trans. Roy. Soc. Victoria, viii., 1868, 105; Gestro, Ann. Mus. Civ. Genova, vii., 1875, 882: *Simoglossus niger* Chaudoir, Rev. & Mag. Zool., 1872, 217; Col. Nov., 1883, 17.

I have no doubt but that I am right in considering this narrow, black species as *Ænigma unicolor*; it is also evident, from Thomson's description, that Castelnau identified *Helluomorpha batesi* rightly; but how Castelnau, Chaudoir, and Gestro mistook Hope's species for one, the size of which was 20×6 mm. (the dimensions given by Gestro for *Gigadema minutum* Cast., which these three authors thought probably identical with *E. unicolor* Hope), surprises me, seeing that Hope gives the size of his species as "Long.7, lat. $1\frac{1}{2}$ lin." Chaudoir, in the "Coleopterorum Novitates," says that he had received his *Simoglossus niger* from Mr. William Macleay under the name of *Helluosoma atrum* Cast.; and that is the name that Sir W. Macleay applied to *H. unicolor* Hope, in his Collection. The generic diagnosis given above is sufficient for the identification of *H. batesi*. Dimensions: length, 13.5; proth., 2.5×2.75 , el., 6.5×3.3 mm.

Hab.—Eastern Coastal Districts, from Clarence River to Cooktown.

EPIMICODEMA, n.gen.

Elongate, depressed, winged, brown. Head small, strongly constricted to a narrow neck; orbits strongly developed behind eyes, setigerous; two supraorbital sensitive hairs on each side. Antennæ short, stout, compressed. Clypeus truncate; one sensitive hair at each side. Labrum large, rounded; one sensitive hair at each side. Mentum with lobes sharply pointed; median tooth prominent, triangular. Ligula wide, rounded on each side; apex emarginate in middle; a sensitive hair at each side of apical emargination a little behind margin. Labial palpi stout; apical joint wide, truncate, about as long as penultimate joint. Maxillæ: inner lobe with apical hook long, sharp, set almost at right angles; inner margin with a lightly developed median prominence; palpi with penultimate joint very short, apical joint wide. Prothorax small, narrow, strongly narrowed to base; upper surface setigero-punctate. Elytra striate; scutellar striole elongate; interstices biserially punctate (punctures of second and fourth tending to become 3-seriate towards apex); eighth biserially punctate, not wider than ninth. Prosternum depressed, without anterior marginal sulcus. Anterior tarsi short; penultimate joint short, wide, lightly emarginate. Type, *Helluosoma mastersi* Macl.

Habits: on tree-trunks, under bark.

A monotypic genus evidently isolated from all others. By the form of its ligula, it is more allied to *Helluodema* than to *Helluosoma*. Though more related to *Helluodema* and *Helluosoma* than to any other genera, there seems no near affinity to either.

EPIMICODEMA MASTERSI Macleay.

Helluosoma mastersi Macl., Trans. Ent. Soc. N. S. Wales, ii., 1871, 83.

Dimensions: length 14 mm.; head 2.2 mm. across eyes; proth. 2.35 × 5; el. 7 × 4 mm.

Hab.—Northern New South Wales to Rockhampton (Brunswick River, N.S.W., Carter; Gayndah, Q., Masters).

Genus HELLUO.

Bonelli, Mém. Acad. Turin, 1813, (Obs. Ent., Pt. ii., p.23).

Depressed, apterous. Head large, punctate; neck wide; eyes convex, lightly enclosed at base; postocular part of orbits small, oblique; one supraorbital sensitive seta on each side. Labrum large, depressed; anterior margin roundly prominent; one sensitive seta on each side. Mentum punctate; median tooth triangular, short, wide, prominent; lobes long, pointed. Ligula wide, convex; anterior margin rounded. Maxillæ with inner lobe not dilatate on middle of inner side; apex lightly but strongly hooked. Prothorax broader than long, punctate, ampliate and rounded at widest part; sides strongly sinuate-angustate to base. Elytra with odd interstices costate. Anterior tarsi wide, hairy; penultimate joint short, deeply circularly emarginate. Type, *H. costatus* Bon.

Habits terrestrial.

An isolated genus belonging to the central group of the Australian Helliunini.

The two species may be differentiated as below:—

Elytra with even interstices depressed, and closely setigero-punctate.....	<i>H. costatus</i> Bon.
Elytra with even interstices glabrous, and only punctate on each side near striæ.....	<i>H. insignis</i> Sl.

HELLUO COSTATUS Bonelli.

Mém. Acad. Turin, 1813; Castelnau, Trans. Roy. Soc. Victoria, viii., 1868, 104; Chaudoir, Rev. & Mag. Zool., 1872, 214; Gestro, Ann. Mus. Civ. Genova, vii., 1875, 872: *H. carinatus* Chaudoir, Bull. Soc. Imp. Nat. Mosc., 1848, i., 107.

Notwithstanding Chaudoir's reclamation in the Revue et Magasin Zoologique, 1872, I follow Castelnau's view that *H. carinatus* Chaud., is conspecific with *H. costatus* Bon. It is one of our best known carabs. Length, 20-26 mm.

Hab.—Eastern Coastal Districts, from Melbourne to Brisbane.

HELLUO INSIGNIS Sloane.

Proc. Linn. Soc. N. S. Wales, (2), v., 1890, 642.

Length 27 mm.

Hab.—New South Wales: Walgett, Bourke, and Garah.

Genus *HELLUAPTERUS*, n.gen.

Convex, apterous. Head large; neck wide; eyes prominent; postocular parts of orbits small, oblique to neck. Antennæ stout, elongate, compressed; four basal joints cylindrical, sparsely setose. Labrum large, depressed, widely rounded at apex, sparingly punctate; one sensitive seta on each side near anterior angles. Mentum deeply emarginate; bottom of sinus forming a short wide prominence in middle; lobes triangular. Ligula wide, roundly prominent at apex; a median double row of widely placed setigerous punctures. Palpi: labial stout; penultimate joint thick, incrassate; apical joint claviform, a little shorter than penultimate; maxillary with penultimate joint short, two-thirds the length of apical; this larger and stouter than apical joint of labial. Maxillæ with inner lobe stout, sharply hooked at apex; inner margin strongly triangularly angulate in middle, beset with separate spiniform setæ on anterior part. Prothorax transverse, strongly ampliate at widest part, strongly sinuate-angustate to base; base truncate. Elytra truncate-oval, convex; interstices 3, 5, and 7 costate; inflexed margins wider and more sparsely setose than usual in the tribe. Metasternal episterna shorter than usual (4×2.5 mm.). Tarsi with penultimate joint narrow, simple; anterior with second and third joints biserially squamose beneath in ♂.

Habits terrestrial.

This genus differs from *Helluo* by the longer basal joints of antennæ (fourth much longer and less densely pubescent); mentum with lobes shorter, median tooth much shorter and wider; maxillæ with inner lobe far less hairy, and with a very strong triangular prominence on middle of inner side; inflexed margins of elytra wider and less setose; joints of tarsi longer, etc. From *Gigadema*, it differs by facies (elytra convex); absence of wings; short metasternal episterna, etc. It is evidently derived from the primitive central stem of the tribe, from which *Helluo*, *Helluarchus*, and *Gigadema* also come.

HELLUAPTERUS NIGER, n.sp.

Robust, oval, convex, sparsely punctate. Elytra truncate-oval, punctate-striate; third, fifth, and seventh interstices raised above others. Black.

Head large (6 mm. across eyes), punctate; front with a rounded rugulose impression on each side; eyes prominent. Mandibles in ♂ very long, decussate. Prothorax broader than long (5.5 × 8 mm.), of equal width at base and apex (4.9 mm.); disc convex; margins wide, explanate; upper surface strongly punctate, the punctures closely placed on lateral margins, more dispersed on disc; sides roundly ampliate just before middle, strongly narrowed to apex in an even curve, obliquely narrowed to posterior fourth and straightened before meeting base; anterior margin truncate behind head; anterior angles widely rounded, hardly advanced; base widely emarginate above peduncle, truncate on each side; basal angles distant from peduncle, well marked, upturned, obtuse at summit. Elytra opaque, convex, much wider than prothorax (17 × 12.3 mm.), oval, truncate at apex, not covering apex of abdomen, widest a little behind middle, lightly but decidedly rounded on sides; humeral angles rounded off; striæ with small separate punctures in their course; interstices shagreened, bi-seriately punctate; punctures small and distant from one another; third, fifth, and seventh interstices lightly costate; even interstices hardly convex, more irregularly punctate. Abdomen convex, hardly punctate except near sides—especially on first and second segments. Length 30, breadth 12.3 mm.

Hab.—Western Australia: Murchison District. I first received this fine species in 1894, from Mr. C. French of Melbourne; recently Mr. W. W. Brown has found it at Anketell, near Cue.

This large, robust species differs greatly in facies from the species of *Helluo* and *Gigadema*; and from *Helluarchus* by facies (elytra truncate, and not depressed on disc, and declivous to sides and apex).

Var. punctata. Differs from the typical form by upper surface more nitid, interstices of elytra nitid, not shagreened; head, prothorax, and elytra far more strongly punctate; elytra less convex, odd interstices less convex (particularly third); puncturation much stronger (punctures larger and deeper) particularly towards sides; striæ more or less interrupted by large punctures, especially towards sides; puncturation of ninth interstice and lateral channel much stronger; under surface generally more strongly

punctate (on head, prothorax, peduncle, metepisterna, posterior coxæ and abdomen). Length 30 mm.

Hab.—Shark Bay. (One specimen from Mr. French).

This may be a distinct species; but having only one specimen, and thinking it possible that forms connecting it with *H. niger* may be found, I have put it tentatively under *H. niger*, as a variety.

HELLUARCHUS, n.g.

Oval, body very large; apterous. Head large; neck wide; eyes prominent; postocular parts of orbits small, oblique to neck. Antennæ stout, not incrassate; four basal joints cylindrical, sparsely punctate, third as long as basal joint, second three-fourths length of third. Labrum large, depressed, rounded at apex, punctate (except near base); one sensitive seta on each side near anterior angles. Mentum punctate; sinus with a short, wide, median prominence; lobes not long, triangular. Ligula cordate, oblique on each side and roundly obtuse at apex. Palpi: labial with apical joint stout, cylindrical, truncate; maxillary with penultimate joint two-thirds length of apical; this stout, truncate, a little larger than apical joint of labial. Maxillæ with inner lobe stout, strongly hooked at apex; inner side sparingly spinose; a prominent, triangular, median prominence. Prothorax transverse, strongly ampliate at widest part, strongly sinuate-angustate to base. Elytra inflated, oval, depressed on disc, striate, rounded at apex; fifth interstice costate, bordering the depressed discal area; sides and apex sharply declivous; inflexed margins wider and more sparsely setose than usual in the tribe. Metasternal episterna shorter than usual (4×2.5 mm.). Tarsi stout; joints sparsely setose; fourth joint widely triangular, hardly emarginate at apex. Habits terrestrial.

The strangely shaped elytra of *Helluarchus*, which are those of an integripenne and not of a truncatipenne, make this one of the most abnormal forms to be found amongst the Carabidæ, and place it quite by itself. Its affinity is evidently towards *Helluapterus*. In general appearance, *H. robustus* resembles the genus *Cuneipectus*.

HELLUARCHUS ROBUSTUS, n.sp.

Stout, oval, glabrous; body very large. Black.

Head large (6.5 mm. across eyes), punctate. Prothorax broader than long (6.3 × 9 mm.); sides inflated and rounded at middle, narrowed in a curve to apex, strongly sinuate at posterior fourth; basal angles distant from peduncle, well marked, obtuse; base (6 mm.) wider than apex (5 mm.); disc sparsely punctate; lateral margins explanate, punctate. Elytra oval (21 × 14 mm.), rounded at apex in an even curve, not quite covering apex of abdomen; disc depressed, bordered by the strongly costate fifth interstice; striæ punctate; interstices sparsely seriate-punctate; punctures small, disposed in two rows on third, fifth, and seventh interstices, more irregular on the others (third interstice raised just before apical declivity, fifth costate, seventh subcostate, the others depressed). Under surface generally more or less punctate; abdomen convex, sparsely punctate towards middle, strongly punctate towards lateral margins. Length 36, breadth 14 mm.

Hab.—Western Australia: Anketell, near Cue (H. W. Brown). Colls. Sloane (type); National Museum, Melbourne; South Australian Museum, Adelaide.

Genus GIGADEMA.

Thomson, Arcan. Ent., 1859, 93; Castelnau, Trans. Roy. Soc. Victoria, viii., 1868, 105; Chaudoir, Rev. & Mag. Zool., 1872, 215: *Penichrodema* Gestro, Ann. Mus. Civ. Genova, vii., 1875, 880.

Depressed, black; winged. Labrum large; one sensitive seta on each side near anterior angle. Labium variable, always wide and rounded on sides. Mentum with a short median tooth; lobes short, triangular, pointed (in *G. longipenne* very long and sharply pointed). Palpi variable; apical joint more or less triangular. Maxillæ with inner lobe sharply pointed; inner side with a median prominence (except in *G. longipenne*). Prothorax roundly ampliate at widest part, strongly angustate at base; basal angles near peduncle. Elytra strong-

ly striate; interstices punctate; apex truncate, membranous. Anterior tibiæ elongate, narrow, inner notch towards distal end; tarsi setose, fourth joint entire, in ♂ second and third joints lightly dilatate, and biserially squamulose beneath. Habits either terrestrial, or on tree-trunks, under bark.

Gigadema represents the central stem of the Australian *Helluonides*, with affinities in different directions towards *Helluapterus*, *Helluarchus*, *Ametroglossus*, *Neohelluo*, and *Ænigma*. Its most puzzling species is *G. longipenne*, which, though evidently a true *Gigadema*, resembles *Helluo* in the form of its mentum, ligula, and maxillæ.

Variations.—*Antennæ*: length and setosity of four basal joints (compare *G. sulcatum* and *G. bostocki*). *Mentum*: median tooth prominent and excised at apex (e.g., *G. nocte*), short with apex rotundate (e.g., *G. rugaticolle*). *Ligula*: convex and non-setose (*G. longipenne*), or more or less depressed and setose; paraglossæ membranous (*G. sulcatum*), corneous (*G. bostocki*). *Maxillæ*: form of inner side, of apex; set of hook; setosity (compare *G. maxillare*, *G. longipenne*, and *G. bostocki*). *Palpi*: length, especially of penultimate joints (compare *G. sulcatum* and *G. bostocki*). *Prothorax*: form and puncturation. *Elytra*: interstices pluripunctate (*G. maxillare*), biserial-punctate (*G. bostocki*). *Trochanters*: posterior oval or pointed (only *G. grande*); intermediate triangularly prominent in middle (*G. longipenne*).

Secondary sexual characters of ♂: mandibles very long and decussate (*G. grande* var. *prominens*); right mandible notched towards apex (*G. bostocki*). *Submentum* armed (in *G. grande*-group). *Maxillæ* with cardo armed (*G. maxillare*).

Phylogeny.—The *sulcatum*-group is the most ancient by short joints of palpi; strong tooth of mentum; membranous paraglossæ with apex free; closely punctate disc of prothorax; setose inflexed margins of elytra, etc. The *grande*-group must also be placed below the *nocte*-group by form of palpi; form of ligula, including membranous paraglossæ; the *nocte*-group is the most recent. *G. longipenne* may have diverged from the

stem from which *G. nocte* is derived, and converged towards a more ancient generalised type by reversionary atavism (*antea*, p.574). The species of *Gigadema* may be arranged in four groups, viz., the *sulcatum*-, *grande*-, *bostocki*-, and *longipenne*-groups; of these, the two last are most closely related; the *sulcatum*-, *grande*-, and *bostocki*-groups have little relationship to one another, but are bound together by evidence of descent from a common central type.

Table of Species.

- 1(22). Ligula with median depression; inner lobe of maxillæ triangularly protuberant in middle of inner side.
- 2(7). Pronotum with the whole upper surface closely punctate. (Palpi short).
- 3(4). Elytra with even interstices closely and confusedly punctate.....
.....*G. froggatti* Macl.
- 4(3). Elytra with even interstices biserially punctate.
- 5(6). Interstices 2-7 convex, nitid in middle; punctures coarse and close together..... *G. sulcatum* Macl.
- 6(5). Interstices opaque, depressed on apical third, weakly costate towards base, punctures not coarse.....*G. biordinatum* Sl.
- 7(2). Pronotum with an impunctate central space. (Palpi with penultimate joint longer than in Section 2).
- 8(15). Labial palpi with apical joint at least two-thirds the length of penultimate. (Gula, or cardo of maxilla armed in ♂).
- 9(10). Prothorax strongly sinuate on sides posteriorly; ♂ with gula unarmed; cardo of maxilla prominently dentate.....*G. maxillare* Sl.
- 10(9). Prothorax lightly sinuate on sides posteriorly; ♂ with gula armed; cardo of maxilla unarmed.
- 11(14). Pronotum with apex truncate, not produced above head; posterior trochanters obtuse.
- 12(13). ♂. Pronotum with middle part of apex slightly more prominent than anterior angles; process of submentum short, wide, its outer angles tuberculiform and pointed outwards..... *G. gulare* Sl.
- 13(12). ♂. Pronotum with anterior angles more prominent than middle part of apex; process of submentum bifid, the lobes short, triangular, pointed downwards.....*G. rugaticolle* Blkb.

* *Note.*—It is certain that there is never, in any species, such a variation in the shape of the prothorax, as is indicated by Gestro for *G. grande*. He has confused the sexes of two different species (*postea* p.600).

- 14(11).Pronotum with apex roundly produced over head, much more prominent than anterior angles in both sexes; posterior trochanters sharply pointed at apex.....*G. grande* Macl.
- 15(8).Labial palpi with apical joint short, not one-half length of penultimate, this unusually long, bowed, and with lower apical angle prominent. (Neither gula nor maxilla armed in male).
- 16(19). ♂. Right mandible simple.
- 17(18).Head with decided postocular prominences; pronotum with middle of anterior margin slightly more advanced than anterior angles...
..... *G. obscurum* Sl.
- 18(17).Head without postocular prominences; pronotum with middle of anterior margin not more prominent than anterior angles... ..
.....*G. nocte* Newm.
- 19(16). ♂. Right mandible with a notch on inner side near apex.
- 20(21).Elytra with interstices biserially punctate.....*G. bostocki* Cast.
- 21(20).Elytra with second, fourth, and sixth interstices more or less confusedly punctate towards apex.....*G. mandibulare* Blkb.
- 22(1).Ligula convex, glabrous; inner lobe of maxillæ not protuberant in middle of inner side..... *G. longipenne* Germ.

The *sulcatum*-group.

Mandibles short. Paraglossæ cartilaginous. Maxillæ with inner lobe moderately setose on upper surface, triangularly prominent at middle of inner side. Palpi short; penultimate joint of maxillary shorter than apical. Prothorax with disc wholly punctate. Male without unusual secondary sexual characters. Gestro has suggested that a distinct name, *Penichrodema*, should be used for this group, but I have not adopted his suggestion. Habits terrestrial.

GIGADEMA FROGGATTI Macleay.

Proc. Linn. Soc. N.S.Wales, (2), iii., 1888, 449.

This species is distinguished from *G. sulcatum* Macl., by smaller size; prothorax narrower, more strongly sinuate to base; elytra with even interstices more densely punctate. Length 17 mm.

Hab.—Queensland: Cooktown (Olive). I have two specimens (♂) from Mr. Olive, of Cooktown, which I have compared with the types of *G. froggatti* Macl., in the Macleay Museum, and have considered identical. It requires studying with more material than I possess.

GIGADEMA SULCATUM Macleay.

Helluo sulcatus Macleay, Trans. Ent. Soc. N.S.Wales, 1864, i., 108; ? *G. paroensis* Castelnau, Trans. Roy. Soc. Victoria, viii., 1868, 106; Gestro, Ann. Mus. Civ. Genova, vii., 1875, 877; *G. minuta* Castelnau, l.c., 107; *G. thomsoni* Castelnau, l.c., 107; *G. dameli* Macleay, Trans. Ent. Soc. N.S.Wales, 1873, ii., 323.

Black. Elytra strongly striate; interstices biserially punctate, convex (particularly towards base), seventh, at least, carinate. Length 20-24, breadth 7.5-9 mm.

The elytra usually have the interstices from second to seventh biserially punctate, but sometimes the fourth and sixth are triserially punctate on the apical part of elytra. One specimen, from Katherine River, has the prothorax narrower, more strongly sinuate towards base; elytra with interstices costate towards base, and with the even ones confusedly punctate: these are the distinguishing characters of *G. paroensis*, as given by Gestro, and this inclines me to believe that *G. paroensis* Cast., is conspecific with *G. sulcatum* Macl. *G. minuta* Cast., is represented in the Howitt Collection, where I have seen it, and recognised it as conspecific with *G. sulcatum*. I have seen the types of *G. dameli* Macl., and could not differentiate it from *G. sulcatum*.

Hab.—New South Wales (I have it from Mulwala, Gernantou, Urana, Junee, Lachlan River, and Bingara): Queensland (Gayndah, Coomoooolaro, Townsville, Port Denison and Cunnamulla): Northern Territory (Katherine River): Western Australia (Onslow).

GIGADEMA BIORDINATUM, n.sp.

Oval. Prothorax with surface wholly punctate (punctures separate, not confused, derm not rugose in centre of disc); elytra striate, interstices biserially punctate, opaque, summits not forming nitid ridges. Black.

Head wide across eyes (5 mm.), punctate (the punctures separate), longitudinally strigose near eyes; one supraorbital

sensitive hair on each side; front lightly and widely bi-impressed. Mentum with median tooth short; wide, not excised at apex. Prothorax subconvex, transverse (4.15×6 mm.); apex with median part truncate; anterior angles widely rounded, a little more prominent than median part; sides ampliate, roundly subangulate at widest part, strongly angustate and sinuate to base; basal angles subrectangular with summit rounded; upper surface punctate, more closely so towards sides; punctures separate, and derm not rugulose towards centre. Elytra much wider than prothorax (13.2×8.4 mm.); striæ shallow, finely and closely punctate; interstices finely shagreened, biserially punctate; the punctures separate, not coarse, not interrupting the summits of interstices. Length 20-23.5, breadth 6.8-8.4 mm.

Hab.—Prince of Wales Island, Torres Straits. I am indebted to Mr. H. J. Carter for a specimen, and two others are in his collection.

Allied to *G. sulcatum* Macl., and *G. froggatti* Macl.; but differing from *G. sulcatum* by punctures of head fewer, smaller and not so close together; prothorax roundly subangulate at widest part, more strongly angustate to base, punctures not so coarse or so close together; elytra with interstices more opaque and depressed, not raised into prominent ridges, the punctures of each row on interstices 2-7 finer, more distant from one another, not causing any crenulation or interruption of the summits of the interstices as in *G. sulcatum*. From *G. froggatti*, by head and prothorax less closely punctate; prothorax much wider; elytra with interstices less costate, even interstices not confusedly punctate, etc. It might be thought to be a well marked variety of *G. sulcatum*, but I have preferred to regard it as a distinct species.

The *grande*-group.

Paraglossæ cartilaginous, free at apex. Maxillæ with inner lobe densely setose on upper side and apex, triangularly prominent at middle of inner side. Palpi long; penultimate joint of maxillary not shorter than apical joint. Prothorax with

disc not punctate. Male, with cardo of maxillæ triangularly prominent, or gula armed; mandibles sometimes very long.

GIGADEMA MAXILLARE, n.sp.

G. grande Gestro, Ann. Mus. Civ. Genova, vii., 1875, p. 879, fig.1 (♀).

Depressed. Head large; prothorax subrotundate, widest about middle; apex lightly and widely produced; sides strongly sinuate-angustate to base; disc smooth, impunctate; elytra striate, interstices closely punctate (more than two rows of punctures on each). Black.

♂. Head large (6.8 mm. across eyes), depressed, finely sparsely punctate towards base and sides; eyes prominent, very lightly enclosed behind; clypeus smooth, a few fine punctures towards sides. Mandibles long, falcate, decussate. Labrum large, depressed, rounded at apex; a setigerous puncture at each anterior angle; surface lævigata with a few fine punctures. Maxilla with cardo projecting downward in a strong, bent, obtuse, horn-like process. Ligula transversely depressed; apex wide, truncate. Mentum with a short, wide, excised, median tooth; lobes triangular; submentum unarmed. Prothorax broader than long (7.1 × 9 mm.), wide at apex (6.8 mm.); rounded on sides, roundly ampliate at middle, strongly angustate posteriorly, strongly sinuate a little before base; apex with middle widely and shortly advanced, rounded and less prominent at anterior angles; base narrow (4.1 mm.), strongly bisinuate (rounded in middle), angles marked, obtuse at summit; median line well marked; margins lightly punctate. Elytra parallel (21 × 12 mm.), punctate-striate; punctures in striæ very small, a little distant from one another; interstices closely and finely setigero-punctate. Posterior trochanters conical, obtuse at apex.

♀. Differs from ♂, by cardo of maxilla unarmed; prothorax with apex less prominent in middle.

Length 27-35, breadth 9-12 mm.

Hab.—Tropical Queensland: Townsville and Kuranda (Dodd), Cooktown (Olive), Princess Charlotte Bay.

Allied to *G. grande* Macl., with which it has been confused by Gestro and Bates, but differing by the male with submentum without a prominent horn, and cardo of maxilla prominent (in *G. grande* ♂, the cardo of the maxilla is merely slightly obtusely prominent); prothorax with widest part situated further back; sides less rotundate, far more strongly angustate posteriorly, and with a strong antebasal sinuosity; elytra with second and third interstices not biserially punctate. The female shows the same difference from the male in shape of prothorax, and puncturation of the second and third interstices of the elytra as in *G. grande*; but does not show differences in the form of the cardo of the maxilla nor of the submentum, these being secondary sexual differences of the male.

It is evident that Gestro confused this species with *G. grande*; the figure he gives as that of the prothorax of *G. grande* ♀, is that of the prothorax of *G. maxillare* ♀. A numerous represented series of specimens has been examined, and no male specimen has had the bifid horn of the submentum as in *G. grande*, nor has been without the prominent horned cardo of the maxilla.

GIGADEMA GULARE, n.sp.

♂. Depressed. Prothorax ampliate, strongly angustate to base, anterior margin truncate, median part a little more advanced than anterior angles, disc not punctate; elytra striate, interstices closely punctate; second, third, and fifth biserially punctate towards base; submentum armed; mentum strongly toothed; ligula wide, roundly oblique on each side to the obtuse apex, rather convex, subdepressed in middle. Piceous-brown.

Head large (6 mm. across eyes); front lightly and widely bi-impressed; impressions subrugulose, space between them transversely rugulose; eyes very prominent. Labrum depressed, closely punctate, except near base; a well marked setigerous puncture on each side. Prothorax broader than long (5.1

× 7 mm.), widest and ampliate about middle, wider across apex (4.2 mm.) than base (3 mm.); sides evenly rounded anteriorly, obliquely narrowed posteriorly, subsinuate before base; anterior margin truncate in middle, a light sinuosity between median part and anterior angles, these near neck, not quite as prominent as median part; base lightly bisinuate; lateral margins punctate; border reflexed, subrotundate posteriorly; basal angles sharply marked; disc a little raised, with some scattered, rather large punctures towards apex and base, finely transversely striolate, especially towards sides. Elytra parallel; striæ finely punctate; interstices closely punctate, especially towards apex. Length 32 mm.

Hab.—Central Australia: Tennant's Creek. (Unique in my collection; received from Mr. C. French).

Closely allied to *G. rugaticolle* Blkb., but differing by prothorax smaller, less strongly rugose, anterior margin more prominent than anterior angles, lateral margins more concave and so forming a wide channel, base less strongly bisinuate, basal angles more sharply marked; elytra more closely punctate, the punctures a little finer, particularly on the odd interstices; ligula more narrowed to apex, with the flattened discal area much smaller, the surface less punctate; tooth of mentum more prominent; gular prominence quite different, shorter and out-turned on each side in a conical process. From *G. grande* Macl., it differs greatly by prothorax smaller, the anterior margin in ♂ not nearly as prominent as in *G. grande* ♀; punctures of elytra closer, the second, third, fourth, and fifth interstices not biserially punctate in the greater part of their course; gular horn of different shape, etc.

GIGADEMA RUGATICOLLE Blackburn.

Piceous-black. Head punctate; front striolate, longitudinally on each side, transversely in middle. Prothorax in ♂ transverse (5.3 × 7.5 mm.), widest about middle, ampliate on sides, wider across apex (4.5 mm.) than base (3.2 mm.), angustate to base; sides hardly subsinuate just before base; ante-

rior margin truncate in middle; anterior angles widely rounded and more prominent than median part; base bisinuate; basal angles obtuse, but marked; disc not punctate, transversely striolate; margins wide; border reflexed, crenulate posteriorly. Elytra parallel (19.5 × 10 mm.); interstices depressed (especially in ♀); third, fifth, and seventh subcostate towards base, even interstices biserially punctate towards base, triserially posteriorly, eighth irregularly 5-seriate. Ligula wide, depressed; anterior margin rotundate. Gula with a wide short bifid prominence, the two points short, erect, obtuse. Maxillæ prominent at base, cardo not projecting beyond stipes. Length 32, breadth 10 mm.

Hab.—Western Australia: Condon (H. M. Giles). Two specimens (♂ ♀) have been examined.

I have identified *G. rugaticolle* Blkb., from the description (founded on ♀). It is allied to *G. grande* Maccl., but differs by elytra with interstices more closely punctate, second 3-seriately punctate, except just near base; mentum with median tooth shorter, wider, rounded at apex; ♂, with prothorax not strongly prominent above head, but actually less prominent at middle than at anterior angles; gular horn much shorter and more deeply divided into two parts. Comparing the anterior margin of the prothorax with that of *G. grande* for both sexes, we find—♂, not strongly and roundly advanced in the middle, but less prominent in middle than the anterior angles, though these are very little advanced: ♀, middle part truncate, and decidedly less prominent than anterior angles (in *G. grande*, middle part truncate, but a little more prominent than anterior angles).

GIGADEMA GRANDE Macleay.

Trans. Ent. Soc. N.S.Wales, i., 1864, 108; ♂, Chaudoir, Rev. & Mag. Zool., 1872, 215; Gestro, Ann. Mus. Civ. Genova, vii., 1875, 879.

Depressed, carbonarous. Prothorax strongly ampliate, strongly obliquely angustate to base without sinuosity; apex

with median part prominent (in ♂ strongly, in ♀ lightly). Elytra with interstices finely punctate, odd ones biserially, even ones more closely and irregularly. Posterior trochanters pointed at apex. Ligula depressed, wide, obtuse at tip. Submentum in ♂ armed with an erect horn, bifid at apex. Length 31-35, breadth 11-11.5 mm.

Hab.—Queensland: Townsville (Dodd), Port Denison (Masters).

Var. prominens. ♂. Head larger; mandibles longer and more strongly curved; submentum with a very short bituberculate prominence; prothorax wider, sides lightly arcuate to base (in *G. grande*, subsinuate), base wider, more strongly bordered. Length 35 mm.

Hab.—Queensland: Coen (Hacker). A single specimen (♂) in Coll. Carter.

The *nocte*-group.

Ligula punctate, depressed in middle of disc; paraglossæ corneous. Maxillæ with inner lobe moderately setose on upper side, triangularly prominent at middle of inner side. Palpi long; penultimate joint of labial long, bowed, apical joint very short; penultimate joint of maxillary longer than apical. Prothorax with disc nitid, and more or less without punctures in middle. Mandibles in ♂ long, sometimes right mandible notched near apex (e.g., *G. bostocki*).

GIGADEMA OBSCURUM. n.sp.

Head with postocular part of orbits swollen beneath eyes; ligula depressed; labial palpi with penultimate joint bowed, more than twice the length of apical joint, this short; prothorax cordate, anterior margin a little more prominent above head than at anterior angles; elytra with interstices biserially punctate near base, closely and more confusedly punctate towards apex.

♂. Head not large (5.5 mm. across eyes), punctate on vertex; eyes prominent; orbits swollen behind and below eyes; submentum not armed; maxilla with cardo not prominent.

Prothorax broader than long (5 × 7 mm.); anterior margin with a sinuosity on each side near neck, median part subemarginate, slightly more advanced than anterior angles, sides strongly rounded anteriorly, obliquely narrowed posteriorly; disc nitid, strongly raised above margins, sparsely punctate (the punctures very scattered in middle). Elytra ordinary (17 × 10 mm.); interstices closely punctate, more or less biserially punctate towards base; punctures becoming 3-seriate towards apex on odd interstices, 4-seriate on even interstices.

♀. Differs from ♂, by head with postocular prominences less developed; prothorax narrower (4.6 × 6.3 mm.).

Length 29, breadth 10 mm.

Hab.—Queensland: Cunnamulla (Hardcastle). Two specimens (♂ ♀) received from Mr. A. M. Lea (Colls. Lea and Sloane).

Allied to *G. nocte* Newm., but differing from all the forms of that species, which I have seen, by postocular prominences more strongly developed (especially in ♂); prothorax with median part of the anterior margin more prominent in comparison with the anterior angles; elytra with interstices more finely and closely punctate. It cannot be *G. longius* Blkb., or *G. longicolle* Blkb., (both unknown to me in nature) on account of the different puncturation of the elytra, and the postocular prominences in both sexes more prominent than in *G. bostocki* Cast., (the prominence in ♀ being more below the eye than in *G. bostocki*). Blackburn indicated his *G. eremita* (which I cannot differentiate from *G. bostocki*) as being a species with well developed postocular prominences.* These prominences also differentiate it from *G. dux* Blkb., which is said to be without them.* I look upon it as the most primitive species of the *nocte*-group, but cannot see any reason for supposing that it is descended from the *grande*-stem; it seems rather an offshoot from some ancient generalised form.

* Trans. Roy. Soc. S. Aust., 1901, p.102, table.

GIGADEMA NOCTE Newman.

Enigma nocte Newman, The Entomol. 1842, 413; Schaum, Berl. Ent. Zeit, 1863, 80: *Gigadema titanum* Thomson, Arc. Ent., 1859, 92: *G. nocte*, Gestro, Ann. Mus. Civ. Genova, 1875, vii., 878.

Right mandible in ♂ not notched on inner side before apex; elytra with interstices 2-7 biserially punctate near base; punctures more confused towards apex.

Var. *typica*. Punctures of elytral interstices tending to be biserial, slightly more confused towards apex. Length 30-38 mm.

Hab.—New South Wales: Germanton, Urana, Grenfell, and Cobar.

Var. *titana* Thomson. Punctures of elytral interstices more dense, biserial only near base. Length 36-47 mm.

Hab.—Queensland: Rockhampton and Cooktown.

I place, under *G. nocte* Newm., all the specimens known to me (a large series) with the second, fourth, and sixth interstices of the elytra confusedly punctate towards apex; labial palpi with penultimate joint bowed; right mandible not notched near apex in ♂.

GIGADEMA BOSTOCKI Castelnau.

Trans. Roy. Soc. Victoria, viii., 1868, 106; Gestro, Ann. Mus. Civ. Genova, vii., 1875, 876: *G. eremita* Blackburn, Trans. Roy. Soc. S. Aust., xvi., 1892, 17: *G. intermedium* var. Gestro, *op. cit.*, vii., 1875, 877.

Black, shining. Prothorax cordate; anterior angles rounded, usually more prominent than middle of anterior margin; sides sinuate or subsinuate before base. Elytra with interstices biserially punctate. Right mandible in ♂ notched before apex. Length 32-40 mm.

Hab.—Western Australia: Cunderdin, Wanneroo, Champion Bay, Cue, Onslow, Kimberley District.

G. bostocki Cast., is a species with a wide range, and is subject to some variation in the shape of the prothorax. I con-

sider *G. intermedium* Gestro, a variety, and *G. eremita* Blkb., as conspecific. Found under logs, on the ground.

A specimen (♂) from Champion Bay is evidently, by its large head, prothorax with juxtabasal sinuosities of sides less marked than in *G. longipenne* Germ., and elytra narrowed to base, the *G. bostocki* of Gestro; this I consider the typical form. A specimen (♂) from Sandstone, near Cue, differs from the typical form by prothorax decidedly sinuate on sides near base; elytra with interstices more convex, more strongly biserially punctate, the punctures closer together in the rows, this is *G. eremita* Blkb., the types of which species I have examined in the South Australian Museum; at present, I do not think *G. eremita* can be maintained as a variety.

Var. *intermedia* Gestro. Length 30-42 mm. I have identified a specimen (♂) from Jerilderie, N.S.W., as *G. intermedium* Gestro; it differs from the typical form of the species by head slightly smaller; prothorax far more strongly sinuate on sides posteriorly, anterior angles less prominent; elytra not narrowed to base, interstices more convex, punctures closer together in the rows. Specimens (♂) from Lake Hattah, Victoria, have the prothorax more convex than the Jerilderie specimen, but are conspecific with it. Specimens (♂) from Cunnamulla, Queensland (received from Mr. Lea), are larger (42 mm.), with the prothorax larger and more ampliate, median part of anterior margin truncate and slightly more prominent than anterior angles, but I cannot differentiate this form from var. *intermedia*.

It may be noted that, in var. *intermedia*, there is a tendency for the sixth interstice of the elytra to become triseriate-ly punctate towards the apex, but I have never seen this character in the western forms of *G. bostocki*. We may suppose var. *intermedia* to be an older form than the western *G. bostocki*. In *G. bostocki* and its varieties, the prothorax is very free from punctures on the disc.

G. bostocki var. *intermedia* ranges from the Mallee districts of North-Western Victoria, through the western parts of New South Wales, into South-Western Queensland.

It is possible that *G. longicolle* Blkb., is a form of *G. bos-tocki* var. *intermedia*, but the examination of specimens from Oodnadatta (including the ♂) would be required to settle this matter.

GIGADEMA MANDIBULARE Blackburn.

Trans. Roy. Soc. S. Aust., xvi., 1892, 18; Var. (?) *G. longius* Blackburn, *op. cit.*, 1901, 101.

♂. Piceous-black. Head large; mandibles long, decussate, right notched on inner side before apex. Prothorax cordate (6.4 × 10 mm.); sides sinuate before base; disc nitid, sparsely punctate, except in centre. Elytra strongly striate; interstices biserially punctate towards base, fourth and sixth wider than others, densely punctate on apical half. Maxillary palpi with penultimate joint longer than apical. Anterior tibiæ long; inner notch considerably nearer apex than base. Length 39 mm.

Hab.—Western Australia: Upper Ashburton River. I received my specimen from Mr. C. French, and have compared it with the type in the South Australian Museum.

A specimen (♀) in my collection agrees with the description given above, but has the prothorax narrower (6 × 8.6 mm.), more convex; margins narrower; disc nitid but more generally covered with punctures; intermediate tibiæ wider at apex, and with external apical angles more strongly dentiform. Length 37 mm.

Hab.—Northern Territory: Tennant's Creek (Field).

This specimen from Tennant's Creek, I compared with a specimen (♀) in the South Australian Museum (from Central Australia, which is ticketed "*Gigadema longius*" in the handwriting of the late Rev. Thos. Blackburn, and I considered it identical. It is, in my opinion, conspecific with *G. mandibulare* (perhaps a variety); but the examination of male specimens from the MacDonnell Ranges would be necessary to deal with it satisfactorily.

The *longipenne*-group.

Ligula convex, smooth; paraglossæ corneous. Maxillæ with inner lobe densely setose on upper side and apex, not triangularly prominent at middle of inner side. Palpi not long and bowed; apical joint of labial three-fourths length of penultimate; two apical joints of maxillary subequal. Mentum with lobes very long and sharply pointed. Prothorax with anterior angles more prominent than median part of apex; disc nitid and impunctate in middle. Elytra with interstices biserially punctate, sometimes tending to become triserially punctate towards apex. Middle trochanters with a triangular prominence on lower side.

GIGADEMA LONGIPENNE Germar.

Helluo longipennis Germar, Linn. Ent., 1848, iii., 162.
Gigadema longipenne Gestro, Ann. Mus. Civ. Genova, 1875, vii., 876: *G. politulum* Macleay, Trans. Ent. Soc. N. S. Wales, 1871, ii., 83.

G. longipenne Germ., is found in South Australia, New South Wales, Queensland, and North-West Australia. It is well known, and is differentiated from all the other species of *Gigadema* by the group-characters given above. *G. politulum* Maccl., is conspecific with *G. longipenne*; I have examined Macleay's type in the Australian Museum, Sydney.

NEOHELLUO, n.gen.

Depressed, winged. Head wide across neck; eyes hemispherical, prominent, lightly enclosed behind in small truncate orbits; one supraorbital sensitive hair on each side. Antennæ narrow, lightly compressed; four basal joints cylindrical. Clypeus wide, truncate, one sensitive hair at each side. Labrum truncate, one sensitive hair near each anterior angle. Mentum deeply emarginate; sinus edentate, oblique on sides; lobes triangular, pointed. Ligula wide, fringed with long setæ; apex prominent in middle; outer surface with four setæ distant from apex; inner surface plurisetose; paraglossæ rudimentary, cartilaginous. Labial palpi long; penultimate joint long, narrow; apical joint three-fourths length of penul-

timate, lightly incrassate. Maxillary palpi long; apical joint a little longer than penultimate; in form like a narrow compressed club. Maxillæ with external angle of cardo forming a short triangular process; inner lobe wide, apex wide, rounded, plurisetose, projecting beyond the spiniform hook. Prothorax hexagonal, widest and obtusely angulate at middle, strongly obliquely angustate to base; apex truncate; anterior angles marked and raised in ♂, rounded in ♀. Elytra striate; striæ minutely punctate; interstices depressed, 2-7 with three rows, eighth with four rows of punctures, third with four widely placed dorsal punctures; humeral angles rounded in ♂. Prosternum strongly declivous to apex; a strong transverse sulcus near anterior margin. Tarsi setose; fourth joint narrow, entire; anterior in ♂ with second and third joints dilatate and biserially squamose beneath.

Neohelluo is nearer to *Enigma* than to any other genus; it also shows some affinity, though remote, to *Gigadema maxillare* Sl. It differs from *Enigma* by labrum shorter; mentum triangularly pointed, not with epilobes developed into strong curved mucrones; ligula with apex more prominent in middle; fringe of setæ longer; inner surface plurisetose towards base; maxillæ with inner lobe more setose, especially at tip, apex projecting far more beyond hook; prothorax differently shaped, basal angle near peduncle, elytra in ♂ without humeral tooth, etc.

NEOHELLUO ANGULICOLLIS, n.sp.

♂. Black. Head large (3.9 mm. across eyes); mandibles very long, curved, bent downward to apex from middle. Prothorax broader than long (4 × 4.6 mm.), wider across apex (2.7 mm.) than base (2.3 mm.), ampliate and roundly subangulate at middle of sides; disc convex; sides obliquely narrowed to apex and base; anterior margin truncate; angles prominent, obtuse, reflexed; lateral margins punctate, wide, strongly reflexed; basal angles near peduncle. Elytra much wider than prothorax (11 × 6.7 mm), striate; striæ minutely punctate;

interstices depressed, 2-7 with three rows of fine punctures, eighth with four rows of punctures, third with four widely spaced dorsal punctures. Length 19.5, breadth 6.7 mm.

Hab.—Tropical Queensland (Dodd). Mr. F. P. Dodd sent me one specimen without exact locality; but I believe it is from somewhere near Cairns. I have seen a second specimen in the South Australian Museum, as from near Cairns.

♀. Differs from ♂ by prothorax narrower (3.5 × 4 mm.), anterior angles rounded off, anterior margin truncate, a little more prominent than anterior angles.

Hab.—Townsville (Coll. Ferguson). One specimen (♀) was sent to me for examination by Dr. E. W. Ferguson, of Sydney.

Genus ÆNIGMA.

Newman, Ent. Mag., iii., 1836, 499.

Depressed, winged; upper surface violaceous or cyaneous. Head wide; eyes semiglobose, lightly enclosed behind; one sensitive supraorbital hair on each side. Antennæ long, slender. Clypeus depressed, widely subemarginate. Labrum large, depressed; apex prominent, widely rounded; one prominent setigerous puncture at each anterior angle, four other less conspicuous setigerous punctures in an irregular row between the two lateral punctures; sides sparsely setose. Mentum edentate; lobes with apex elongate, pointed. Ligula convex, wide, cordate; inner surface with a few long setæ on basal half. Palpi: labial with two apical joints subequal, apical rather narrow, truncate; maxillary with apical joint wide, securiform. Maxillæ with inner lobe not prominent at middle of inner side; apex slightly prominent, tufted with hair; hook placed at right angles, long, slender. Prothorax transverse, wide at base; sides not ampliate, not strongly angustate to base; basal angles distant from peduncle. Elytra with interstices wide, lightly convex, 1-6 biserially punctate, third with four or five distantly placed dorsal punctures, eighth wide, pluripunctate; humeral angles in ♂ strongly dentate, in ♀ rounded; setæ pale. Prosternum strongly declivous before

coxæ. Tarsi with penultimate joint narrow, simple. Type, *Æ. iris* Newm. Length 17-21 mm.

Habits: on tree-trunks, under bark.

This is a terminal genus of ancient origin, more allied to *Neohelluo* than to any other genus.

ÆNIGMA IRIS Newman.

Ent. Mag., iii., 1836, 499; Castelnau, Trans. Roy. Soc. Victoria, viii., 1868, 108; Gestro, Ann. Mus. Civ. Genova, vii., 1875, 874; Chaudoir, Rev. & Mag. Zool., 1872, 213. Variety — *Æ. newmani* Castelnau, l.c., 108; Gestro, l.c., 872; *Æ. splendens* Castelnau, l.c., 109; Gestro, l.c., 873.

Castelnau recognised three species of *Ænigma*, *Æ. iris*, *Æ. newmani*, and *Æ. splendens*; but, Gestro, when reviewing the Australian Heliuonini, reduced these to two by uniting *Æ. splendens* to *Æ. newmani*. It is my belief, after examination of thirteen specimens, four of which were females, that only one species should be recognised, namely, *Æ. iris* Newm.; and that the narrower, more cordiform shape of the prothorax, on which Castelnau and Gestro relied for the separation of *Æ. newmani*, should not be considered as of full specific value. The considerations which induce me to come to this opinion are—(a) The form with the narrow prothorax is reported by Castelnau from Sydney (*Æ. newmani*) and Port Denison (*Æ. splendens*)—that is, from the southern and northern districts of the range of *Æ. iris*. (b) A specimen(♀) is in my collection (most likely from the Rockhampton District) which, by its unusually narrow prothorax, with the sides more angustate to the base, and basal angles more obtuse than in the typical form, evidently represents *Æ. newmani*; but, I cannot think it more than a variety. (c) Mr. H. W. Brown has given me a specimen(♂) which has the prothorax with the sides more sinuate behind than usual, so that they meet the base at right angles, the basal angles being marked and rectangular; usually the sides of the prothorax are hardly subsinuate, and the basal angles are obtuse at the summit. My conclusion is that the shape of the prothorax varies in *Æ. iris*, and that the varietal name *Æ. newmani*(= *Æ. splendens*), may be used for the race with the prothorax narrow.

AMETROGLOSSUS, n.gen.

Depressed, black, winged. Head wide across eyes; neck narrow; orbits behind eyes small, oblique; eyes large, prominent; one supraorbital seta on each side. Antennæ long, narrow, lightly compressed; four basal joints cylindrical. Clypeus emarginate-truncate; one sensitive hair on each side. Labrum large, depressed; apex prominent in middle; one sensitive hair on each side. Mentum with lobes long, triangular, pointed; median tooth prominent, triangular. Ligula furcate; each side produced in a narrow curved lobe turned upwards at the apex; lateral margins with about six setæ on each side behind lobes; one sensitive hair on basal half of each lobe; inner surface with four setæ near margin of sinus. Paraglossæ rudimentary, cartilaginous; apex pointed, free. Palpi with apical joint securiform. Maxillæ strongly hooked; apex not projecting beyond hook, densely beset with hair; inner side lightly rounded in middle. Prothorax roundly ampliate at widest part, strongly sinuate-angustate to base; upper surface very sparsely punctate, transversely striolate. Elytra striate; striæ minutely punctate; interstices shagreened, subconvex, biserially punctate (including eighth), fifth with five widely placed dorsal punctures, ninth with a double row of large punctures. Prosternum depressed; no transverse marginal sulcus. Anterior tarsi, in ♂, with second and third joints widely dilatate and biserially squamose beneath; fourth joint small, rather transverse; in four posterior tarsi small, entire. Type, *Gigadema atrum* Macl.

Habits: on tree-trunks, under bark. A monotypic genus, with vague general affinities towards *Gigadema* and *Neohelluo*; although it has a forked ligula, it has no affinity to *Dicranoglossus*, the only other genus in which the ligula is forked.

AMETROGLOSSUS ATER Macleay.

Gigadema atrum Macl., Proc. Linn. Soc. N. S. Wales, (2), ii., 1887, 217.

Dimensions: head (across eyes) 4·1; proth. 3·75 × 5 (apex 3·5, base 2·5); elytra 14 × 8 mm.

Hab.—Queensland: Kuranda (Dodd).

Geographical Distribution of the Helluonini.

The present distribution of the Helluonini is as under—
Ethiopian Region (*Macrocheilus*, *Meladroma*, *Trienogenius*).
Oriental Region (*Macrocheilus*, *Omphra*, *Creagris*). Neotropical
Region (*Helluomorpha*, *Pleuracanthus*). Australian Region
(*Creagris*, *Helluonidius*, *Dicranoglossus*, *Helluosoma*, *Helluodema*,
Epimicodema, *Helluo*, *Helluarchus*, *Helluapterus*, *Gigadema*,
Neohelluo, *Enigma*, *Ametroglossus*). Of the genera found in
Australia, only *Creagris* (evidently an immigrant from the north)
and *Helluonidius* (*H. chrysocomes* Maind., in New Guinea) have
been found beyond the limits of the continent of Australia. The
Australian group of the Helluonini can be looked upon only as
an autocthonous subtribe peculiar to Australia, like its autocthonous
flora, and probably derived from the same ancient land, which formed
the place of origin of the autocthonous flora (probably some part of
Australia is a remnant of this old land); it seems altogether unlikely
that the Helluonini could have reached Australia from the Antarctic
source whence came the marsupials, at a later date. The distribution
of the Helluonini in Australia, Africa, and South America brings to
mind the similar distribution of the genus *Megacephala*; though the
Helluonini should be more adaptable to widely varying conditions,
owing to the free-living habits of carabideous larvæ, in comparison
with the fixed burrow-inhabiting mode of life of cicindelideous
larvæ, which must cause fewer situations to be suitable to the
development of the latter.

With regard to the distribution of the Helluonini throughout
Australia, I have little exact data. All our genera, except
Helluo, *Helluarchus*, and *Helluapterus*, occur in the heavily
wooded coastal parts of tropical Queensland. As far as I know,
only *Helluo* is found in Southern Victoria, and no Helluonid has
been reported yet from the moist, heavily timbered, south-western
part of the continent.

Helluonidius ranges from the Hawkesbury River, N.S.W., to
Port Darwin, also to New Guinea; its range inland is unknown.
Dicranoglossus is found in tropical Australia; its range inland
and westward is unknown. *Helluosoma* is found in tropical

Australia, but the area of its range is unknown. *Helluodema* extends, in the eastern coastal districts, from the Clarence River to Cooktown. *Epimicodema* has been found from the Clarence River to Rockhampton; its range inland is unknown. *Helluo* is found in Eastern Australia; *H. costatus* from Brisbane to Wilson's Promontory throughout the mountains and coastal districts; *H. insignis* on the Darling River from Walgett to Bourke; *Helluarchus* from Cue, W. A., to the MacDonnell Ranges. *Helluapterus* is from North-West Australia (Onslow and Cue). *Gigadema* may be divided into four groups. (1) The *sulcatum*-group ranges from the Murray River, N.S.W., to Onslow, W.A.; its range in Central Australia is unknown. (2) The *grande*-group is found in tropical Australia; its range inland is unknown. (3) The *nocte*-group is very widely spread in Queensland, New South Wales, Northern Territory, Western Australia, and the northern parts of South Australia, also North-Western Victoria. (4) The *longipenne*-group contains but one species, *G. longipenne* Germ., which is found over the greater part of the continent; but is not yet reported from Queensland (north of Gayndah), Victoria (south of the Dividing Range), nor the south-western part of Australia. *Neohelluo* and *Ametroglossus* are tree-dwelling genera from the forests of tropical Queensland. *Enigma* is found in the coastal districts, from Sydney to Port Denison. *Creagris* is found in Ceylon, Java, Bangkok, and tropical Queensland.